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AN ECOLOGICAL EXCURSION TO MOUNT KTAADN.

Le Roy Harris Harvey.

(Plate 44.)

In company with a party,[1] representing the Ecological department of the Hull Botanical Laboratory of the University of Chicago, it was again my great pleasure to visit in August of the past year one of the most inaccessible and grandest mountains in New England, Ktaadn.

We took our departure from Stacyville on the fifteenth and spent the following day at Lunksoos in preparation for the mountain. The seventeenth saw us fairly started on our way and it was to be over two weeks before we should again share the hospitality of Lunksoos. Our course lay over the old Ktaadn trail as far as Sandy Stream Pond tote-road. Here we diverged to the northwest traveling along the tote-road for about a mile, then skirting the southern shore of Sandy Stream Pond we came to Ross Camps a few hundred 'yards beyond. From here we followed the new Rogers trail, recently cut for pack horses, which leads more directly (seven miles) to the South Basin, the site of our camp. Our return was over the same route.

In purpose our visit to the mountain was mainly ecological, espe-

[1] Drs. Henry C. Cowles and Bradley M. Davis, Department of Botany, University of Chicago; Samuel M. Coulter, Shaw School of Botany, St. Louis; A. F. Blakeslee, Department of Botany, Harvard University; John Thompson, Richmond, Indiana; Horace W. Britcher, Department of Biology, University of Maine, Orono; H. G. Barber, New York City; Mrs. Henry C. Cowles, Chicago; Miss Laura H. Bevans, Cook County Normal School, Chicago; Miss F. Grace Smith, Department of Botany, Smith College, Northampton, Massachusetts; Miss Jane Stearns, Chicago; Miss Maud L. Bates, Topeka.

cially in relation to true alpine conditions and climatic and edaphic timber lines. Much interesting data was obtained upon these points and will form the basis of an ecological discussion of the mountain to appear later.

Although the energies of the party were almost wholly devoted to a comprehensive ecological study rather than to purely floristic work, yet many noteworthy plants were recorded and the range of several species widely extended. These will be discussed below.

Composed as our party was of so many botanists, nearly all the great groups of plants had their devotees. So a division of labor was easily adjusted. To Dr. Davis and Miss Smith fell the Algae and Liverworts; Dr. Cowles became responsible for the crustaceous lichens, and Mr. Blakeslee and Miss Stearns for the foliaceous and fruticose forms. Mr. Coulter and Miss Bates devoted their energies to the mosses, while the writer gave his attention to the vascular plants. Reports on all these collections are to be expected.

Entomology was not without its enthusiasts for Mr. Britcher in the Arachnids and Mr. Barber in the Hemiptera are both specialists in their respective groups. Some very important and pioneer contributions along these lines may be expected.

The North West Basin.

The unique feature of our visit to Ktaadn was perhaps the exploration of the North West Basin, as we have called it, by four of the party[1] in a three days' side trip. We are, it is believed, the first scientific party to make a descent into this basin and though it is not the purpose of this article to describe the topography of the mountain, for this has been well done by Hamlin[2], Tarr[3], and others, yet a detailed description of this basin may be of interest, as it seems to be the least known of any part of the mountain. Williams[4] in a footnote speaks of its inaccessibility and the lack of knowledge

[1] Drs. Cowles and Davis, Mr. Blakeslee, and the writer.

[2] Hamlin, C. E. Observations upon the Physical Geography and Geology of Mount Ktaadn. Bull. Mus. Comp. Zool. Harvard 7: 206–223. 1881.

[3] Tarr, R. S. Glaciation of Mt. Ktaadn, Maine. Bull. Geol. Soc. Am. 11: 433–448. 1900.

[4] Williams, E. F. Comparison of the Floras of Mt. Washington and Mt. Katahdin. Rhodora 3: 163. 1901.

concerning it. Hamlin and Tarr seem not to have been aware of its existence.

This North West Basin, as seen from the west slope of the Northern Ridge, appears as an abysmal amphitheatre enclosed on three sides by precipitous walls with a small lake in its floor and with a very broad gateway opening to the northwest. In general form the basin suggests the capital letter V with its base slightly rounded. Its eastern arm is formed by the precipitous West wall of the Northern Ridge extending here very nearly north. The wooded North slope of the North West Spur, omitted from Williams[1] sketch map, makes the other arm of our capital letter. By the confluence of the Northern Ridge and the North West Spur as they join the North Mountain, the rounded base of our letter is formed. The floor of the basin is virtually a shelf cut from the North West Spur, apparently by glacial action. Its altitude, some 2945 feet, is about 50 feet lower than that of South Basin. In width, it varies from 200 to 250 yards. From this shelf a precipitous descent of 250 ft. leads to the valley proper below. The mouth of the basin opens broadly to the northwest into the valley of the Middle Branch of the Wissataquoik, whose southeast boundary is formed by the Northern Ridge extension, while the Sourdnahunk range to the northwest makes its opposite drainage slope.

Nestled at the base of the North West Spur and on the shelf described above are four small ponds, evidently morainic in origin. The largest (Fig. 1), nearly five acres in extent, and the most western is the only one visible from the mountain and then only from the West slope of the Northern Ridge. Rarely seen it has scarcely been reported, for parties with limited time seldom visit this part of the mountain. The shores are boulder strewn, sloping off rapidly to some depth; the spruce, fir, birch, and alders come to its very edge. The outlet stream at the northeast end of the pond plunges almost immediately over the brow of the shelf. It functions, however, only at high water after heavy rains and the Spring freshets and must at such a time go plunging and roaring over the precipitous granite walls in its mad race to the valley 250 feet below. As the bed of the stream was perfectly dry at the time of our visit we used this outlet as a means of descent, but this was possible only through the

[1] Loc. Cit. pg. 162.

abundant aid received from the birch and alder which grow to its very limits, for the outlet has no depth, but the water plunges over the smooth reddish granite as do so many of the slope streams of Ktaadn.

In altitude Lake Cowles (2938 ft.), as it may be called, is hardly above that of Chimney Pond (2928 ft.) though from the mountain it appears several hundred feet higher. While much disappointed in this respect we were, however, recompensed with some rare finds. *Nuphar Kalmianum*, *Nymphaea odorata minor*, *Potamogeton confervoides* and *Isoëtes heterospora* rewarded our endeavors.

The second pond, less than one half as large, which soon comes into sight as one descends the west slope of the Northern Ridge, is the most eastern and lies 250 yards to the east, near the confluence of the two spurs with North Mountain at the base of our capital letter V. Its shore features are similar to those of Lake Cowles except that on the east a heath society comes to the waters edge. Davis Pond, as we may call it (and not Lake Cowles, the largest of the ponds) is fed from above by a high waterfall. This source of water supply seems permanent, for we found a brawling mountain torrent as we slowly and tremblingly made our way down by the aid of the trees over its precipitous and treacherous bed, only to be driven back lower down by a vertical wall of nearly 200 ft. and forced to cross over and descend by an old avalanche-slide farther to the right.

The outlet of Davis Pond, thus differing from that of Lake Cowles, is a permanent stream but must similarly be increased into a powerful plunging waterfall in spring by the great increment of the melting mountain snows and heavy rains. Flowing over the steep walls of the shelf, the outlet stream plunges down the valley to join that of Lake Cowles about a mile below; and together they contribute to the Middle Branch of the Wissataquoik some three miles farther down the valley.

The northwest shore of Davis Pond is rather low and has long been used as winter yards by deer and moose. In places the trees and bushes have been entirely trampled down and killed. In these open places have come up a luxuriant growth of grasses, brakes and various herbs surrounded by an alder zone. Here we found *Splachnum roseum* growing in the greatest profusion on the dung of both deer and moose. *Lycopodium Sitchense*, *Petasites palmata*, *Aster puni-*

ceus, and *Osmunda Claytoniana* in great profusion, were also recorded from here.

Two more small ponds yet remain to be described. Between Lake Cowles and Davis Pond lies the third. It is about 150 ft. by 50 ft., with its longer axis running nearly east and west, and is very shallow, being nearly filled with vegetable debris accumulated from the wooded drainage slopes about it. Its shores are meadow-like and are fast encroaching on the pond proper which is itself so filled with vegetation-islands that one may walk safely across it anywhere. The future of this pond is very evident. It empties into Davis Pond along its northwestern shore.

This meadow-like society gave us an abundance of *Lycopodium inundatum* in its characteristic habitat and such other forms as *Scirpus caespitosus*, *Carex rigida Bigelowii*, *Viola blanda*, *Ledum latifolium*, *Pyrus arbutifolia*, and *Kalmia glauca*.

The last pond, a little larger than the third, is some 150 yards to the northeast of Davis Pond, and lies very near the edge of the shelf and almost in an east and west line with Lake Cowles. The outlet joins that of Davis Pond soon after it enters the valley proper below. In character this pond resembles closely Davis Pond but is less than one third its size. We recorded here no additional rarities.

Rising from and occupying the greater part of the shelf are two large *roches moutonnées* carved out by glaciation (fig. 1). The smaller forms the northeast shore of Davis Pond and the east shore of its outlet, while the larger one lies east and west extending from the outlet of Davis Pond to Lake Cowles. The summits, some 10 to 15 feet above the general level of the shelf, are flat-topped and present an unique plant society.

Wooded at the base and up the slopes by spruce, fir, and birch, the flat glaciated tops present a striking contrast in a well developed alpestrine heath society (fig. 2). *Kalmia augustifolia* is the dominant species, with *Cassandra calyculata* and *Ledum latifolium* as secondary forms. Together they give the society its characteristic xerophytic tone. Less important forms are *Chiogenes serpyllifolia*, *Empetrum nigrum*, and *Vaccinium canadense* all growing in the dense mats of *Cladonia rangiferina* and its less common variety *alpestris*. Around the bases of bare knobs of rock *Vaccinium uliginosum* is found densely matted.

Spruce islands (fig. 2) of low straggling trees have pushed out into

this heath, which is also being encroached upon from below by the forest. That this heath is one day doomed to be a feature of the past can hardly be doubted.

At the base of the South wall of our basin, over which the cataract inlet of Davis Pond falls, is a meadow-like society similar to that found at the base of the dripping West wall of the North Basin. Indeed, its very presence is due to the spray and seepage from the cliffs above. *Calamagrostis Canadensis*, *C. Langsdorfii*, *Scirpus caespitosus*, *Prenanthes trifoliolata*, *Aster radula*, *Habenaria dilatata*, *Solidago macrophylla*, *Arnica Chamissonis*, and *Diervilla trifida* are among the more characteristic forms which constitute this meadow society.

ADDITIONS TO THE VASCULAR FLORA OF MOUNT KTAADN.

In presenting these additions and extensions in range of the flora of Mount Ktaadn it must be stated that our report embraces much territory previously unexplored, the North West Basin, the west slopes of the South Mountain, the North Spur, and the outer limits of the Great Basin including a small sphagnum bog along the trail near the foot of Lower Basin Pond. Many of our rarest finds, however, were made in those places most thoroughly explored by former parties, which illustrates the very restricted distribution of the rarer forms and strongly emphasizes "that many seasons will be required before we know approximately the bulk of its flora."

We were disappointed in not finding the rare little *Saxifraga stellaris comosa*, which has here its only stations in the eastern United States, and the evasive *Carex rariflora* not reported since Prof. Goodale found it in 1861. Several species of carices and grasses also escaped our notice. Though we found not all the old we were richly rewarded by the new. Fernald's summary[1] of the Ktaadn flora enumerates one hundred and eighty-three species and varieties. To this we have added thirty-eight forms, making the total known vascular flora of Mount Ktaadn two hundred and twenty-one species and varieties.

In the appended list the species new to Ktaadn are indicated by an

[1] Fernald, M. L. The Vascular Plants of Mount Katahdin. RHODORA 3: 166–177. 1901.

asterisk (*) before the name. Further notes on distribution will be found under each species. No asterisk being used an extension in range only is indicated.

Osmunda Claytoniana L. Sphagnous depressions, mesophytic woods, Camp Kennedy; "Moose yards," North West Basin.

* *Osmunda cinnamomea* L. Growing abundantly on the northern shore of the sphagnum bog, Great Basin.

Aspidium aculeatum Braunii Doell. Inlet of Chimney Pond, half way up to the crest, where it occurred only sparingly.

* *Asplenium Filix-foemina* Bernh. Common in mesophytic woods of the Great Basin, extending into the North Basin and as far as Camp Kennedy in the South Basin; common in the North West Basin and along the west slopes of the North Spur.

Pteris aquilina L. Open places, South Basin; common in sphagnum bog, Great Basin.

Lycopodium Selago L. From summit to shores of Lower Basin Pond, imperceptibly grading into *L. lucidulum* Michx. *L. Selago* is apparently a xerophytic form of *L. lucidulum*, which replaces it in more mesophytic habitats. All transitions were found varying with the environment.

* *Lycopodium inundatum* L. Abundant on the meadow-like shores of a small pond in the North West Basin.

* *Lycopodium annotinum* L. Common in mesophytic woods, South Basin, and in the *Krummholz* (scrub growth) on the table-land. Passes into *L. annotinum pungens* Spring, which replaces the type in xerophytic habitats. Extends up to West Peak.

Lycopodium Sitchense Rupr. Frequent on floor of North West Basin. We are able to record an interesting variation in the length of the peduncle of this species. Lloyd and Underwood[1] in their review of the North American species of this genus write in respect to the above species: "peduncles short (less than 1 cm.)." One specimen bearing nine strobili gave respectively the following measurements of the peduncle: 1.5, 1., .8, 1., .8, .2, .3, sessile, and .1 cm. Another specimen from a shaded habitat bearing three strobili possessed peduncles of

[1] Bull. Torr. Bot. Club, **27**: 162. 1900.

the following length, 2.5, 2., and 1.8 cm. respectively. As the shorter peduncled forms are invariably those from exposed positions obviously this difference in peduncular length is one of ecological variation in response to edaphic conditions.

* *Isoëtes heterospora* Eaton. Growing in 1–5 ft. of water, rocky shores of Lake Cowles where it was very abundant. This locality is its second in Maine (Jordan Pond, Mt. Desert, being the other) and extends its northern limit about 125 miles as well as its altitudinal limit some 1000 feet.

Isoëtes echinospora Braunii Eng. Common in 1–2 ft. of water, rocky shores, Lower Basin Pond (2500 ft.). It is interesting in this respect to note the occurrence of this species in the Lake of the Clouds (3500 ft.), Mt. Mansfield, Vt.

* *Potamogeton confervoides* Reichb. Sparsely growing in 1 foot of water, Lake Cowles.

* *Scheuchzeria palustris* L. Abundant as a pioneer in the sphagnum bog, Great Basin.

* *Zizania sp.* Common in Middle and Lower Basin Ponds; North West Basin Ponds.

* *Brachyelytrum erectum* Beauv. Along path leading from Camp Kennedy to Chimney Pond. Not common.

* *Poa alpina* L. Rare on the West walls of the North Basin at 4500 ft.

* *Bromus ciliatus* L. Common in the alpestrine meadow society at the foot of the dripping West walls of the North Basin; in a similar habitat South West wall of North West Basin.

* *Eriophorum gracile* Koch. Common in the sphagnum bog, Great Basin.

* *Carex pauciflora* Lightf. Common in the sphagnum bog, Great Basin.

* *Carex intumescens* Rudge. Frequent in meadow society at base of the dripping West wall of the North Basin; in similar habitat, base of North East wall of North West Basin; meadow, Dry Pond.

* *Juncus articulatus* L. Characteristic of the boggy shores of Lower Basin Pond.

* *Smilacina trifolia* Desf. Very characteristic of the border of the sphagnum bog, Great Basin.

* *Habenaria obtusata* Rich. Abundant in the mesophytic woods

of the Great Basin extending up in the South Basin to the foot of Saddle Slide.

* *Populus balsamifera* L. Two clumps were recorded as on the west shore of the Rocky Ponds in the North Basin.

* *Arceuthobium pusillum* Peck. On *Picea nigra*; extends well up in the Great Basin; on the east shore at the mouth of Lower Basin Pond outlet it forms a beautiful example of Arceuthobium *Krummholz.*

* *Nuphar Kalmianum* Ait. Common, rocky shores of Lake Cowles.

* *Nymphaea odorata minor* Sims. Less abundant and with the above.

* *Actaea alba* Bigel. Rare in mesophytic woods, Great Basin; extending up as far as Dry Pond.

* *Sarracenia purpurea* L. Common in the sphagnum bog, Great Basin.

* *Drosera intermedia* Hayne. A pioneer in the sphagnum bog, Great Basin; growing in the shallow water with *Scheuchzeria.*

* *Pyrus arbutifolia* L. f. Abundant, the sphagnum bog, Great Basin; North West Basin.

* *Amelanchier spicata*, Dec. Rare, West wall of North Basin on gravelly shelf.

* *Trifolium repens* L. Few plants introduced at old camp site, North shore of Chimney Pond.

Empetrum nigrum L. It is of interest to note the occurrence of this species in the sphagnum bog, Great Basin.

* *Acer Pennsylvanicum* L. Common in "cuttings" at base of West slopes of North Spur.

* *Aralia nudicaulis* L. Mesophytic woods, Great Basin.

Osmorrhiza sp. A species of Osmorrhiza occurs frequently in the mesophytic woods, North West Basin.

* *Monotropa uniflora* L. Abundant in mesophytic woods, Great Basin, extending to foot of Saddle Slide; North West Basin, mesophytic woods.

Monotropa Hypopitys L. Abundant in mesophytic woods; having a similar distribution to the species above with which it always occurs.

Vaccinium uliginosum L.

Vaccinium Vitis-Idaea L.

Chiogenes serpyllifolia Salisb.

It is of interest to note in addition to *Empetrum nigrum* the occurrence of these ericads in the sphagnum bog, Great Basin.

* *Prunella vulgaris* L. Introduced at old camp site, Chimney Pond.

* *Galeopsis Tetrahit* L. Introduced around "Camp Kennedy"; Chimney Pond; Rogers trail.

* *Rhinanthus Crista-Galli* L. Rare, gravelly shelves, dripping West wall, North Basin (4600 ft.). This addition makes another species in common with Mt. Washington, reducing by one the species peculiar to the latter.

* *Plantago major* L. Introduced at old camp site, Chimney Pond.

Galium triflorum Michx. West walls, North Basin; South West walls, North West Basin.

Linnaea borealis L. Mesophytic woods, Great Basin, extending into the *Krummholz* where it reaches perhaps its greatest development.

* *Lobelia Dortmanna* L. Rare, rocky shores of Lake Cowles, North West Basin.

* *Aster puniceus* L. Uncommon, shores of Lower Basin Pond; "Moose Yards," North West Basin, where a single plant only was noticed. Its determination was based wholly upon vegetative characters as the specimen was not in flower. It was found again later in flower near Saddle Slide.

* *Anaphalis margaritacea* Benth. & Hook. Sparingly on Saddle Slide.

* *Petasites palmata* A. Gray. Common in "Moose Yards" in the North West Basin. No flowering specimens were found.

FURTHER NOTES ON THE HEPATICAE OF MT. KTAADN.

The notes and determinations of the Liverworts, collected by Dr. Davis and Miss Smith, have been placed in my hands for report. The determinations were made by Dr. Alexander W. Evans. It is to be much regretted that Kennedy and Collins in their list[1] have

[1] Kennedy, G. G. and Collins, J. F., Bryophytes of Mount Katahdin. RHODORA 3: 181. 1901.

given no distributional notes. Consequently I have listed the entire collection with notes on their distribution. To the seventeen reported forms we add ten making a total of twenty-eight species of Hepaticae now known to Mt. Ktaadn.

The asterisk has the same meaning as in the list of vascular plants above.

* *Pellia*? Specimens all sterile. Rocky shores of ponds in the North West Basin; similar habitat, Chimney Pond.

Marsupella emarginata (Ehrh.) Dumort. In water along shores of Lower Basin Pond; North Peaks, among rocks.

* *Jamesoniella autumnalis* (DC.) Steph. In woods North West Basin, growing with *Ptilidium ciliare* and *Lepidozia reptans*.

Lophozia ventricosa (Dicks.) Dumort. Rocky shores of Chimney Pond; Saddle, among rocks; Dry Brooks, among rocks.

Lophozia inflata (Huds.) M. A. Howe. Tableland, among rocks; sphagnum bog; shores of Lower Basin Pond.

* *Lophozia Michauxii* (Web.) Macoun. In alpine mat, Saddle and Tableland.

Lophozia? Among rocks, Tableland.

* *Mylia Taylori* (Hook.) S. F. Gray. In alpine mat among wet rocks, East slope near Saddle.

* *Cephalozia bicuspidata* (L.) Dumort. Among rocks, Saddle and Tableland.

* *Cephalozia lunulaefolia* Dumort. On old logs, North Basin trail.

* *Kantia trichomanis* (L.) S. F. Gray. On old logs, North Basin trail.

Bazzania trilobata (L.) S. F. Gray. Borders of Dry Pond; South Basin, moist woods generally.

* *Lepidozia reptans* (L.) Dumort. On old logs and rotten wood, North West Basin.

Blepharostoma trichophyllum (L.) Dumort. On old logs in woods, North Basin trail.

* *Temnomia setiforme* (Ehrb.) M. A. Howe. Among rocks along shores of Chimney Pond.

Ptilidium ciliare (L.) Nees. Very common everywhere extending to the summit.

Diplophylleia taxifolia (Wahl.) Trevis. In a spring near Lower Basin Pond.

Scapania undulata (L.) Dumort. Borders of Lower Basin Pond; on logs in Great Basin; dry brook near brow of Table-land.

* *Frullania Oakesiana* Aust. On balsam fir, South Basin. Rather common.

HULL BOTANICAL LABORATORY, University of Chicago.

EXPLANATION OF PLATE 44.— Fig. 1 (upper): Shelf at base of the North West Spur of Ktaadn, showing Lake Cowles and the larger of the *roches moutonnées* to the right; Sourdnahunk Range to the west.

Fig. 2 (lower): Heath society on the larger of the *roches moutonnées*, showing the encroachment of spruce; Sourdnahunk Range to the west.

RECENTLY RECOGNIZED SPECIES OF CRATAEGUS IN EASTERN CANADA AND NEW ENGLAND, — I.

C. S. SARGENT.

SINCE the publication in RHODORA in February and April, 1901, of several species of Crataegus found in the Champlain valley by Mr. Ezra Brainerd and other Vermont botanists, and in the neighborhood of Montreal by Mr. J. G. Jack, numerous collections of these plants have been made in Canada and New England. These disclose new forms which have previously remained unrecognized. Some of these are described in the following papers, while others cannot be properly characterized until they have been more fully studied in the field.

§ CRUS-GALLI.

Crataegus exigua, n. sp. Glabrous with the exception of a few hairs along the upper side of the midribs of young leaves. Leaves mostly erect, oblong-obovate and rounded or acute at the apex, cuneate and entire below the middle, above and often only toward the apex finely serrate, with straight or incurved teeth; bright red when they unfold and nearly fully grown when the flowers open, at maturity subcoriaceous, dark green and lustrous on the upper surface, paler and dull green on the lower surface, 3.5–5 cm. long, 1.5–2.5 cm. wide, with broad midribs raised and rounded on the upper side and